1.4.6

EE24BTECH11058 - P.Shiny Diavajna

Question: If the point $P\left(2,1\right)$ lies on the line segment joining points $A\left(4,2\right)$ and $B\left(8,4\right)$, then

Solution:

Variable	Description
$P\left(2,1\right)$	Point on the linesegment joining A and B
$A\left(4,2\right)$	one end of the linesegment AB
$B\left(8,4\right)$	another end of the linesegment AB

TABLE 0: Variables Used

$$\|A-B\| = \sqrt{(A-B)^{\top}(A-B)}$$
$$A = \begin{pmatrix}4\\2\end{pmatrix} B = \begin{pmatrix}8\\4\end{pmatrix}$$
$$(A-B) = \begin{pmatrix}-4\\-2\end{pmatrix}$$
$$(A-B)^{\top} = \begin{pmatrix}-4 & -2\end{pmatrix}$$

$$AB = \sqrt{\begin{pmatrix}-4 & -2\end{pmatrix}\begin{pmatrix}-4\\-2\end{pmatrix}} = \sqrt{20} = 2\sqrt{5}$$

Similarly,

$$AP = \|A-P\| = \sqrt{\begin{pmatrix}-2 & -1\end{pmatrix}\begin{pmatrix}-2\\-1\end{pmatrix}} = \sqrt{5}$$
$$PB = \|P-B\| = \sqrt{\begin{pmatrix}-6 & -3\end{pmatrix}\begin{pmatrix}-6\\-3\end{pmatrix}} = \sqrt{45} = 3\sqrt{5}$$

Therefore,

$$AP = \frac{1}{2}AB$$

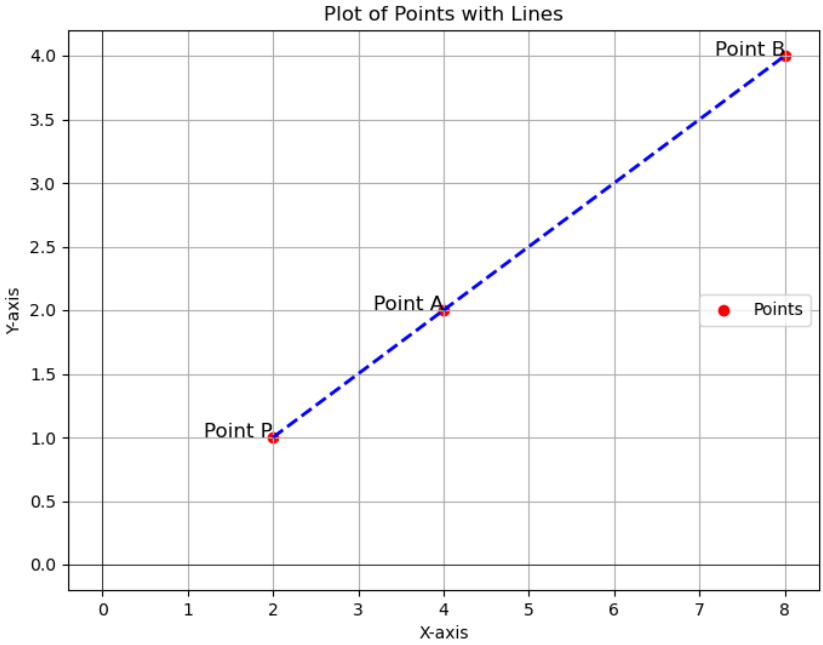

Fig. 0.1: Plot of Points A,B and P